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UPGRADED DETERMINISTIC ENERGY EFFICIENT CLUSTERING PROTOCOL FOR WIRELESS SENSOR NETWORK

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ABSTRACT

The combination of sensing computation and communication in to a single tiny device is known as wireless sensor network. A WSN routing protocol is based on either network structure or protocol operation. A specialized network made up of a large number of sensors and at least one base station is WSN. Development of a routing protocol is one of the major issues in WSN. This is energy efficient and has a significant impact on the overall life time of the sensor network. In this research paper we purpose a deterministic energy efficient clustering protocol with dynamicheterogeneity with four level of clustering scheme which make the existing protocol more dynamic, distribute, self-organizing and more energy efficient than the existing protocol.

KEYWORDS: Wireless Sensor Network, Multilevel Clustering, Distance Based Routing, Cluster Heads, Base Station

INTRODUCTION

Introduction to Wireless Sensor Network

A wireless sensor network (WSN) is a network consists of low-size and low-complex devices referred as sensor nodes that may sense the environment or surroundings and gather the knowledge collected is forwarded, via multiple hops relaying to a sink (also referred to as controller or monitor) that may use it domestically, or is connected to alternative networks [2]. In a sensor field the sensor nodes are typically scattered as shown in Figure 1. Every scattered sensor nodes gather information and route information back to the sink node. Information is routed back to the end user by multichip infrastructure design through the sink node as shown in Figure 1. The sink could communicate with the task manager node via web/internet or Satellite [3].

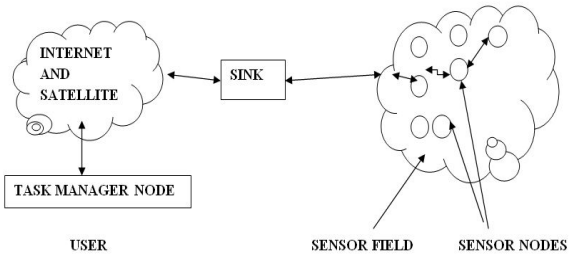

Figure 1: Sensor Nodes Spreaded in a Sensor Field [9]

Designing protocols and applications for such networks needs to be network energy aware as an output of the embedded batteries substitution of the may be a terribly troublesome method once these nodes are installed. Sensors usually link the physical world with the digital world by capturing real-world development and changing these into a kind that may be processed, stored, etc. Sensors offer remarkable or incredible benefits when integrated into varied devices, machines, and environments [1]. They will avoid the infrastructure failures, conserve precious natural resources,

boost productivity, improve security, and upgrade new applications such as systems and smart home technologies.

The miniaturization of computing and sensing technologies allows the development of small, low-power, and cheap actuators, sensors, and controllers.

Sensing is a very important technique that is used to gather information about a physical object or process including change in the state such as drop in temperature or pressure. The object that usually perform sensing task is termed as sensor. It consists of basic elements. Elements of sensor node are shown as below:

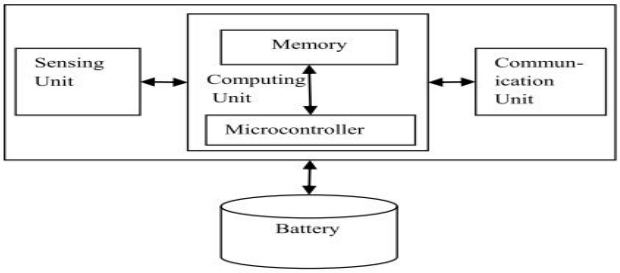

Figure 2: Element of Sensor Node

For example, the human being is equipped with sensors they are able to capture optical data from the surroundings (eyes), acoustic information or data like sounds (ears), and smells (nose). These are the examples of remote sensors, which do not touch the monitored object to collect data. From a technical view, a sensor may be a translates parameters or events within the physical world into signals that may be measured and surveyed. Transducer is another unremarkably used term, in which tool or device is usually used to describe that converts energy from one kind into another [1].

When several sensors hand and glove monitor giant physical environments, then they usually outline a wireless sensor networks. Networks of many sensor nodes are usually wont to monitor giant geographic areas and statement environmental pollution and flooding, grouping structural health data on bridges using vibration sensors etc.

Proposed Work

The improved DEC protocol is proposed the number of rounds as well as stability of network is increased as compared to original DEC protocol. The ideas behind proposed DEC protocol are given below:

- **Multilevel Clustering:** As compared to three levels of nodes defined in the multilevel clustering model of original DEC protocol, the proposed DEC the multilevel clustering is engaged in four levels of nodes is used to describe which is better suited for defining heterogeneous environment. It must be noted that the total energy of network is kept same as that of original DEC protocol. Network stability in heterogeneous network is increased with this new clustering model.
- **Distance Based Routing:** The distance between nodes and cluster heads is calculated, after the comparison is made it ensures the minimum distance between the member node and the cluster head. The condition of minimum routing distance is fulfilled by which cluster head is sending the join request. In this way the utilized energy via data transmission from member node to CH is reduced to possible extent which results in improve network lifetime. So without affecting the network stability the no of rounds gets increased to possible extent.

- **Cluster Head Selection at Each Round:** Selected cluster head is different at different round ensured by the proposed DEC. Without checking the residual energy the previously selected cluster head is released from the role of cluster head after the completion of first round .Instead the proposed DEC checks for the node which has maximum residual energy in whole cluster so that it becomes new cluster head for next round. For the defined number of rounds this cycle repeat itself. This method guarantees the uniform energy utilization of the network by selecting different cluster heads at different rounds thus the stability gets increased to possible extent without affecting the number of rounds.

The flowchart of Proposed DEC protocol is shown in Figure 3 According to the Figure 3 the proposed IDEC protocol will ensure different Cluster head selection at different rounds as explained in above discussion.

At first, the base station (BS) selects n number of cluster heads at round r = 1 and initially the new cluster head check loop says yes and the cluster head ID (CH-ID) is broadcasted and CH waits for the request from the cluster members. The cluster members send join request message accordingly to minimum routing distance to the nearest cluster head. The cluster head stop waiting and setup a TDMA schedule for all cluster members (CMs). CH then checks residual energies (REs) of all of its CMs. The CMs then start transmission of data to the CH which after receiving aggregates the data and transmits to base station then the election process for another cluster head selection is initiated.

In election process the previously selected cluster head is released from its role as cluster head and a new node which having highest energy in the whole cluster is selected as new cluster head and then again loop starts from check new cluster head and again the above explained procedure runs.

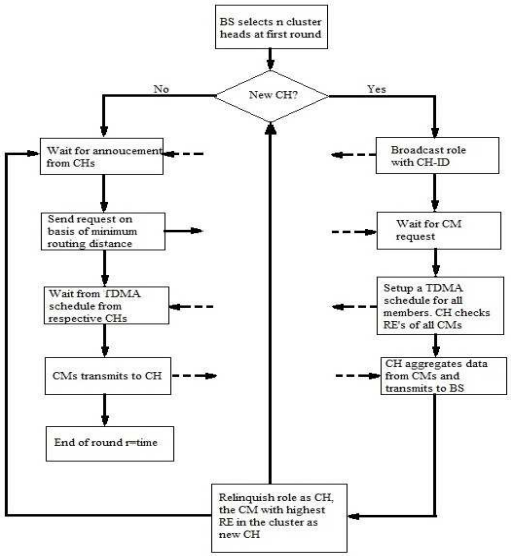

Figure 3: Flowchart of Proposed DEC

Simulation and Result

For the analysis of our proposed algorithm we have used a laptop of 2GB RAM with a processor of DUAL CORE having speed 2GHZ and result process the effectiveness of our proposed algorithm that with increasing the clustering heterogeneity the performance of our WSN in term or energy throughput; as well as life time of the network get enhance.

The comparison is being done with SEEP, LEACH & DEC and graph shown have proven to be good result or the algorithm.

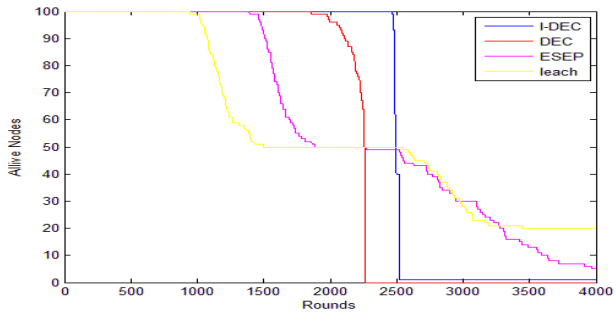

Figure 4: The Alive Node of the Different Protocol

Network lifetime analysis is performed with the protocol consider using Figure 4. In general DEC improves the WSN lifetime compared to LEACH, ESAP, and I-DEC Figure 4 shows the behavior of these protocols to energy heterogeneity. It is worthy of note that DEC care is at right angle to the knee point the gradual decent the beginning is result of different energy level of nodes in the network DEC prove the superior up to when 60% of the nodes are alive.

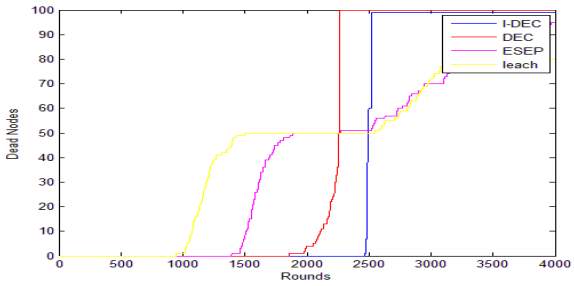

Figure 5: The Dead Node of the Different Protocol

We analyze the residual energy of each node during the network operation by observing the variation of energy level between nodes at 100 round intervals from round 100 to 1000. We observe a similar phenomenon in DEC, ESAP and LEACH. Again we compute the standard deviation for the residual energy among nodes of the each protocol. The fast decrease in the DEC curve from 100 to 1000 round shows clearly that DEC balance energy consumption in the network better than the other protocol by adapting well to heterogeneity. As the network progress from 100 to 1000 DEC reduce the energy gap within the network. Overall performance DEC compared to the other protocol is significant. The DEC protocol has achieved our goal of well balance energy.

CONCLUSIONS

In this paper a purely deterministic protocol DEC better utilizes the most valuable network resource (energy) in WSN is introduced.Improved DEC outperforms the probabilistic-based models we have considered, by guaranteeing that a fixed number of cluster-heads are elected per round. Elected cluster-heads at different rounds are using the local information of their residual energies within which each cluster chooses the appropriate cluster-heads. As discussed earlier, improved DEC has been able to distribute the energy utilization in the WSN evenly among the nodes; hence the nodes die out almost at the same time. The characteristic of IDEC is very desirable as it is close to an ideal solution andwith increasing the heterogeneity of the network the lifetime of the network also improves. In future we will introduce the five level clustering and super nodes. IDEC performance is better than to the other then protocol.

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